Maryland
Department of
the Environment

MWC NOx RACT Mass Loading Limits during Periods of Startup and Shutdown

February 26, 2017

Purpose

On June 12, 2015, the Environmental Protection Agency (EPA) published an updated startup, shutdown and malfunction (SSM) policy in the Federal Register, 80 Fed. Reg. 33840-01. The SSM Policy, in part, provides guidance to states for development of alternative emission limitations during SSM events. There are seven criteria that the guidance recommends states consider when setting an alternative emission limitation. The purpose of this document is to address those seven specific criteria as appropriate considerations for developing emission limitations in NOx RACT SIP provisions that apply during startup and shutdown for large municipal waste combustors (Large MWCs).

Section XI.D. of the SSM Policy provides recommendations for the development of alternative emission limitations applicable during startup and shutdown. *See 80 Fed. Reg.* at 33980. A state can develop special, alternative emission limitations that apply during startup or shutdown if the source cannot meet the otherwise applicable emission limitation in a State Implementation Plan (SIP). SIP provisions may include alternative emission limitations for startup and shutdown as part of a continuously applicable emission limitation when properly developed and otherwise consistent with Clean Air Act (CAA) requirements.

The EPA recommends that, in order to be approvable (*i.e.,* meet CAA requirements), alternative requirements applicable to the source during startup and shutdown should be narrowly tailored and take into account considerations such as the technological limitations of the specific source category and the control technology that is feasible during startup and shutdown.

EPA's Current Startup, Shutdown, Malfunction (SSM) Policy

EPA has revised prior guidance provided in the CFR with respect to startup, shutdown and malfunctions. Alternative emission limitations may be developed for startup, shutdown or other normal modes of operation, but no longer may be applied during periods of malfunction.

EPA's current SSM Policy states: "EPA is reiterating and clarifying its prior guidance concerning how states may elect to replace existing exemptions for excess emissions during SSM events

with properly developed alternative emission limitations that apply to the affected sources during startup, shutdown or other normal modes of source operation (*i.e.,* that apply to excess emissions during those normal modes of operation as opposed to during malfunctions)." 80 Fed. Reg. at 33845.

"The EPA recognizes that…some sources may need to take steps to control emissions better so as to comply with emission limitations continuously, as required by the CAA, or to increase durability of components and monitoring systems to detect and manage malfunctions promptly." 80 Fed. Reg. at 33849.

EPA's SSM policy provides that in the event of a malfunction which causes excess emissions, consideration for enforcement discretion should be exercised, provided reasonable care to avoid malfunctions and good operating practices are being followed by the source operator: "The EPA emphasizes that the absence of an affirmative defense provision in a SIP, whether as a freestanding generally applicable provision or as a specific component of a particular emission limitation, does not mean that all exceedances of SIP emission limitations will automatically be subject to enforcement or automatically be subject to imposition of particular remedies. Pursuant to the CAA, all parties with authority to bring an enforcement action to enforce SIP provisions (*i.e.,* the state, the EPA or any parties who qualify under the citizen suit provision of section 304) have enforcement discretion that they may exercise as they deem appropriate in any given circumstances. For example, if the event that causes excess emissions is an actual malfunction that occurred despite reasonable care by the source operator to avoid malfunctions, then each of these parties may decide that no enforcement action is warranted." 80 Fed. Reg. at 33852.

Seven Criteria for Startup, Shutdown Events

The EPA identifies the following seven specific criteria as appropriate considerations for developing emission limitations in SIP provisions that apply during startup and shutdown (80 Fed. Reg. at 33912):

(1) The revision is limited to specific, narrowly defined source categories using specific control strategies (*e.g.,* cogeneration facilities burning natural gas and using selective catalytic reduction);
(2) Use of the control strategy for this source category is technically infeasible during startup or shutdown periods;

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(3) The alternative emission limitation requires that the frequency and duration of operation in startup or shutdown mode are minimized to the greatest extent practicable;
(4) As part of its justification of the SIP revision, the state analyzes the potential worst-case emissions that could occur during startup and shutdown based on the applicable alternative emission limitation;
(5) The alternative emission limitation requires that all possible steps are taken to minimize the impact of emissions during startup and shutdown on ambient air quality;
(6) The alternative emission limitation requires that, at all times, the facility is operated in a manner consistent with good practice for minimizing emissions and the source uses best efforts regarding planning, design, and operating procedures; and
(7) The alternative emission limitation requires that the owner or operator's actions during startup and shutdown periods are documented by properly signed, contemporaneous operating logs or other relevant evidence.

The Department addressed these seven criteria for emission limitations that apply during startup and shutdown for Large MWCs in the following ways:

(1) The revision is limited to specific, narrowly defined source categories using specific control strategies (*e.g.,* cogeneration facilities burning natural gas and using selective catalytic reduction)

Under proposed COMAR 26.11.08.10D, the Department provides for alternative facility-wide, mass loading NOx emission limits averaged over a 24-hour period. These alternative limits only apply to Large MWCs that have a capacity greater than 250 tons per day. Specifically, these alternative Startup/Shutdown limits apply to the Montgomery County Resource Recovery Facility (MCRRF) and Wheelabrator Baltimore, Inc. (Wheelabrator).

MCRRF and Wheelabrator utilize selective non-catalytic reduction (SNCR) for control of NOx emissions. Therefore, MDE's alternative NOx emission limitations are limited to apply to MWCs that have a capacity greater than 250 tons per day and use SNCR.

(2) Use of the control strategy for this source category is technically infeasible during startup or shutdown periods

COMAR 26.11.08.10B requires updated NOx RACT limits for Large MWCs. In part, the proposed regulations set NOx 24-hour block average emission rates to be met at all times except for periods of startup and shutdown. The 24-hour block average emission rates are steady state

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(normal operation mode) emission limits in parts per million by volume (ppmv), which is a measure of concentration. This concentration measurement is calculated as mass of NOx emitted / volumetric gas flow rate from the stack.

During periods of startup and shutdown, the volumetric gas flow rate from the stack is transient, as adjustments are made to the amount of air introduced into the furnace. The 24-hour block average emission rate for Large MWCs is defined as a value of NO_x emissions in ppmv, corrected to 7 percent oxygen. Therefore, the 24-hour block average emission rate is mathematically adjusted so that the volumetric gas flow rate from the stack is corrected to 7 percent oxygen.

The mathematical oxygen correction would result in an artificially high NOx "concentration reading", even though the amount (mass) of actual NOx emissions would remain unchanged during startup or shutdown. Therefore, it is necessary to set alternative NOx emission limits based on mass of NOx emitted during periods of startup and shutdown (transient periods).

(3) The alternative emission limitation requires that the frequency and duration of operation in startup or shutdown mode are minimized to the greatest extent practicable

COMAR 26.11.08.01B(60)(c) defines "Startup" for a Large MWC as commencing when the unit begins the continuous burning of municipal solid waste and continuing for a period of time not to exceed three hours; but does not include any warm-up period when the particular unit is combusting fossil fuel or other non-municipal solid waste fuel, and no municipal solid waste is being fed to the combustor.

Continuous burning begins once municipal solid waste is fed to the combustor. Once municipal solid waste is being fed to the combustor, the MWC operates continuously until a shutdown is initiated.

COMAR 26.11.08.01B(54)(e) defines "Shutdown" for the MCRRF as commencing thirty minutes after the chute to the loading hopper of the combustion train is closed and ending no later than three hours thereafter.

COMAR 26.11.08.01B(54)(f) defines "Shutdown" for the Wheelabrator facility as commencing thirty minutes after municipal solid waste feed to the loading hopper has ceased and ending no later than three hours thereafter.

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By definition the duration of startup and shutdown procedures for a Large MWC are not to exceed three hours per occurrence, which minimizes the duration of the startup or shutdown to the greatest extent practicable. The alternative 24-hour mass emission limits established by COMAR 26.11.08.10D, apply during these times.

(4) As part of its justification of the SIP revision, the state analyzes the potential worst-case emissions that could occur during startup and shutdown based on the applicable alternative emission limitation

Under COMAR 26.11.08.10D, the Department proposes facility-wide, mass loading NOx emission limits averaged over a 24-hour period to determine the NOx load to the ambient atmosphere on days where there is a startup or shutdown event. The mass loading limits include emissions during the startup or shutdown. In addition, on days where the unit experiences startup or shutdown, the concentration-based 24-hour block average emission rate in COMAR 26.11.08.10B will also apply for the 24-hour period after startup or the 24-hour period before shutdown, as applicable.

Mass NOx emission limits take into account the design flue gas flow rate and represent the worst case actual NOx emissions that could occur during periods of startup and shutdown. These mass NOx emission limits, applicable to each Large MWC, provide equivalent stringency to the concentration limits that apply at all other times. The 24-hour block average NOx emissions rates of COMAR 26.11.08.10B are part of the calculation used to derive the mass NOx emission limits of COMAR 26.11.08.10D. Mass emission limit calculations are derived utilizing 40 CFR 60.58b(h)(2) of subpart Eb (Concentration correction to 7 percent oxygen) or 40 CFR 60.45 (Conversion procedures to convert CEM data into applicable standards). EPA Method 19 may also be utilized to determine NOx emission rates based upon oxygen concentrations. Facility average flue gas flow rates are also utilized into the calculations. The calculation methodology for the mass emission limits is based upon the existing Prevention of Significant Deterioration (PSD) Approval for each affected facility. Mass based emission calculations for each affected Large MWC are detailed below.

<u>Wheelabrator Baltimore, Inc.</u>

Mass based emission calculations for Wheelabrator utilize the facility average flue gas flow (106,336 dscf/min) and O2 (10.7%) values from the facility's 2017 stack test and the 150 ppmv NOx 24-hour block average emission rate from COMAR 26.11.08.10B.

150 ppm7% x (20.9-10.7)/13.9) x 1.194E-7 x 106,336 dscf/min x 60 min/hour x 3 boilers
= 252 lbs/hour

EPA Method 19-NOx ppm to lbs/dscf Conversion Factor:
1.194 E-7 = 46 lbs/lb-mole /385.3 dscf lb-mole/1,000,000

Montgomery County Resource Recovery Facility

Mass based emission calculations for Montgomery County Resource Recovery Facility utilize the facility average flue gas flow (91,204 dscf/min) and O2 (8.1%) values as provided by the facility based upon their Prevention of Significant Deterioration (PSD) Approval and the 140 ppmv NOx 24-hour block average emission rate from COMAR 26.11.08.10B.

$$\frac{46.01\ (lb/lb\text{-}mol)*(20.9-8.1)/(20.9-7.0)*140.00(ppmdv)*91{,}204\ (dscfm)*(1800/2250)*60(m/h)*3\ Boiler\ Units}{3.853E{+}08\ (ft3/lb\text{-}mol)}$$

= 202 lbs/hr

(5) The alternative emission limitation requires that all possible steps are taken to minimize the impact of emissions during startup and shutdown on ambient air quality

The specific steps that each affected facility takes to operate and minimize the impact of emissions during startup and shutdown are listed in the Appendix of this Technical Support Document, as provided by the facility.

Under COMAR 26.11.08.10A and G, the Department is proposing the following provisions:

A. The owner and operator of a Large MWC shall minimize NOx emissions by operating and optimizing the use of all installed pollution control technology and combustion controls consistent with the technological limitations, manufacturers' specifications, good engineering and maintenance practices, and good air pollution control practices for minimizing emissions (as defined in 40 CFR §60.11(d)) for such equipment and the unit at all times the unit is in operation, including periods of startup and shutdown.

G. Not later than 45 days after the effective date of this Regulation, the owner or operator of a Large MWC shall submit a plan to the Department and EPA for approval that demonstrates how the Large MWC will operate installed pollution control technology and combustion controls to meet the requirements of §A of this Regulation. The plan shall summarize the data that will be

collected to demonstrate compliance with §A of this Regulation. The plan shall cover all modes of operation, including but not limited to normal operations, startup, and shutdown.

Compliance for Large MWCs will be dependent upon the facilities operating their units as specified in the approved plans during all modes of operation, including but not limited to normal operations, startup, and shutdown.

(6) The alternative emission limitation requires that, at all times, the facility is operated in a manner consistent with good practice for minimizing emissions and the source uses best efforts regarding planning, design, and operating procedures

Under COMAR 26.11.08.10A, the Department is proposing the following provision:

A. The owner and operator of a Large MWC shall minimize NO_x emissions by operating and optimizing the use of all installed pollution control technology and combustion controls consistent with the technological limitations, manufacturers' specifications, good engineering and maintenance practices, and good air pollution control practices for minimizing emissions (as defined in 40 CFR §60.11(d)) for such equipment and the unit at all times the unit is in operation, including periods of startup and shutdown.

Under COMAR 26.11.08.10G, the Department is proposing the following provision:

G. Not later than 45 days after the effective date of this regulation, the owner or operator of a Large MWC shall submit a plan to the Department and EPA for approval that demonstrates how the Large MWC will operate installed pollution control technology and combustion controls to meet the requirements of §A of this Regulation. The plan shall summarize the data that will be collected to demonstrate compliance with §A of this Regulation. The plan shall cover all modes of operation, including but not limited to normal operations, startup, and shutdown.

Compliance for Large MWCs will be dependent upon the facilities operating their units as specified in the approved plans during all modes of operation, including but not limited to normal operations, startup, and shutdown. The MWC facility will provide quarterly reports detailing that the emission limitations have been met.

(7) The alternative emission limitation requires that the owner or operator's actions during startup and shutdown periods are documented by properly signed, contemporaneous operating logs or other relevant evidence

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Under COMAR 26.11.08.10H, the Department is proposing the following provisions:

Beginning July 1, 2019, the owner or operator of a Large MWC shall submit a quarterly report to the Department containing:
(1) Data, information, and calculations which demonstrate compliance with the NOx 24-hour block average emission rate as required in §B of this Regulation;
(2) Data, information, and calculations, including NOx continuous emission monitoring data and stack flow data, which demonstrate compliance with the startup and shutdown mass NOx emission limits as required in §D of this Regulation;
(3) Flagging of periods of startup and shutdown and exceedances of emission rates;
(4) NOx continuous emission monitoring data and total urea flow rate to the boiler averaged over a 1-hour period, in a Microsoft Excel format; and
(5) Documented actions taken during periods of startup and shutdown in signed, contemporaneous operating logs.

Under COMAR 26.11.08.10L, the Department is proposing the following provision:

L. Compliance with the NOx mass loading emission limitation for periods of startup and shutdown in §D(1) of this Regulation shall be demonstrated by calculating the 24-hr average of all hourly average NOx emission concentrations from continuous emission monitoring systems, utilizing stack flow rates derived from flow monitors, for all the hours during the startup or shutdown period.

Under COMAR 26.11.08.10M, the Department is proposing the following provision:

M. Compliance with the NOx mass loading emission limitation for periods of startup and shutdown in §D(2) of this Regulation shall be demonstrated by calculating the 24-hr average of all hourly average NOx emission concentrations from continuous emission monitoring systems, utilizing the applicable Prevention of Significant Deterioration calculation methodology, for all the hours during the startup or shutdown period.